What is claimed is:

1. A tunable filter means comprising a polarization-sensitive tunable filter element and a polarization-maintaining multi-pass optical means for defining paths whereby a light beam is directed to traverse the polarization-sensitive tunable filter element a predetermined plurality of times.

2. A filter means according to claim 1, further comprising means for adjusting the filter element to select different wavelengths of the light beam.

3. A filter means according to claim 1, further comprising polarization control means for decomposing the light beam into its ordinary and extraordinary components to produce first and second light beams, respectively, having linear, mutually orthogonal states of polarization, rotating the state of polarization of either or both of the first and second light beams until the states of polarization are parallel to each other and one of the principal axes of the tunable filter element.

4. A filter means according to claim 2, further comprising polarization control means for decomposing the light beam into its ordinary and extraordinary components to produce first and second light beams, respectively, having linear, mutually orthogonal states of polarization, rotating the state of polarization of either or both of the first and second light beams until the states of polarization are parallel to each other and one of the principal axes of the tunable filter element.

5. A filter means according to claim 1, wherein the polarization-maintaining multi-pass optical means comprises a pair of right-angle reflectors each having a pair of reflective surfaces arranged at right angles to each other and juxtaposed so that a light beam incident upon one of the reflectors substantially obliquely to one of the reflective surfaces thereof is reflected by both reflective surfaces thereof to emerge substantially parallel to the direction of incidence, being incident upon the other reflector obliquely to one of its surfaces and being reflected by both surfaces to emerge substantially parallel to the direction of incidence, each reflection effectively rotating a propagation direction of the light beam about the reflection point, the arrangement being such that the light beam is reflected by each reflector surface a predetermined number of times and, for some or all reflections of the light beam at a particular surface causing one direction of rotation, there will be a corresponding reflection at the same surface causing rotation in

an opposite direction, such that inaccuracies in the angle between each pair of the reflective surfaces are compensated.

6. A filter means according to claim 1, wherein the multi-pass optical means comprises a pair of right angle reflectors juxtaposed so as to reflect said light beam back and forth there between so as to traverse the tunable filter means a predetermined plurality of times while maintaining its polarization state.

7. A filter means according to claim 6, wherein the pair of right angle reflectors each have a pair of reflective surfaces extending at a right angle to each other, the reflectors being juxtaposed so that a light beam incident upon one of the reflectors obliquely to one of its reflective surfaces will be reflected back and forth between the right angle reflectors to traverse the polarization-sensitive tunable filter means said predetermined plurality of times.

8. A filter means according to claim 7, wherein at least one of the pair of right angle reflectors includes a planar surface extending substantially perpendicular to the paths taken by the light beams when travelling between the pair of reflectors and, truncating the pair of reflective surfaces short of an apex between notional extensions of the surfaces, the planar surface for either receiving or emitting said light beam.

9. A filter means according to claim 6, wherein the pair of reflectors is selected from porro prisms, pi prisms and hollow roof mirrors.

10. A filter means according to claim 7, wherein the pair of reflectors is selected from porro prisms, pi prisms and hollow roof mirrors.

11. A filter means according to claim 8, wherein the pair of reflectors is selected from porro prisms and pi prisms.

12. An optical spectrum analyzer apparatus comprising an inherently polarization-sensitive tunable filter element, a polarization-maintaining optical means for defining paths whereby a light beam is directed to traverse the polarization-sensitive tunable filter element a predetermined number of times, and a polarization control module for receiving input light for analysis, decomposing the received input light into its ordinary and extraordinary components to produce first and second light beams having respective mutually orthogonal linear states of polarization, and applying the first and second light

beams to the tunable filter element by way of the optical means with their states of polarization parallel to each other and to one of the principal axes of the tunable filter element, the apparatus further comprising means for adjusting the tunable filter element to select different wavelengths of the input light and means for detecting the first and second light beams leaving the tunable filter element and detecting energy at each of said different wavelengths.

13. An optical spectrum analyzer according to claim 12, wherein the polarization control module comprises means for rotating the state of polarization of at least one of the first and second light beams relative to the state of polarization of the other of the first and second light beams before application to the tunable filter element.

14. An optical spectrum analyzer according to claim 13, wherein the rotating means comprises a polarization-maintaining fiber.

15. An optical spectrum analyzer according to claim 12, wherein the detection means comprises first and second detectors for detecting energies of the first and second light beams, respectively, after their traversal of the polarization-sensitive tunable filter means, and providing corresponding first and second electrical signals, respectively.

16. An optical spectrum analyzer according to claim 15, wherein the detecting means further comprises means for summing the first and second electrical signals.

17. An optical spectrum analyzer apparatus according to claim 12, wherein the polarization-maintaining optical means is arranged to direct the linearly-polarized first and second light beams from the polarization control module through the filter element in one direction and the resulting filtered light beams through the filter element in the opposite direction, and back to the polarization control module, such that the light beams pass through the polarization control module in a reverse direction to that taken by the first and second light beams when passing therethrough to the tunable filter element and are recombined thereby.

18. An optical spectrum analyzer apparatus according to claim 17, further comprising bi-directional coupling means for coupling the input light beam into the polarization control module and the recombined filtered light beams from the polarization control module to the detection means.

19. An optical spectrum analyzer according to claim 12, wherein the angle-tuned filter means comprises a Fabry-Perot filter.

20. An optical spectrum analyzer according to claim 12, wherein the angle-tuned filter means comprises a thin film dielectric filter.

21. An optical spectrum analyzer according to claim 12, wherein the polarization-maintaining optical means comprises multi-pass optical means for directing each of the two light beams to traverse the polarization-sensitive tunable filter means a predetermined plurality of times.

22. An optical spectrum analyzer according to claim 21, wherein the multi-pass optical means comprises a pair of right angle reflectors juxtaposed so as to reflect each of said light beam components back and forth between them said predetermined plurality of times while maintaining its polarization state.

23. An optical spectrum analyzer according to claim 22, wherein the pair of right angle reflectors each have a pair of reflective surfaces extending at a right angle to each other, the reflectors being juxtaposed so that a light beam incident upon one of the reflectors obliquely to one of its reflective surfaces will be reflected back and forth between the right angle reflectors to traverse the polarization-sensitive tunable filter means said predetermined plurality of times.

24. An optical spectrum analyzer according to claim 23, wherein at least one of the pair of right angle reflectors includes a planar surface extending substantially perpendicular to the paths taken by the light beams when travelling between the pair of reflectors and truncating the pair of reflective surfaces short of an apex between notional extensions of the surfaces, the planar surface for either receiving or emitting at least one of the light beams.

25. An optical spectrum analyzer according to claim 21, wherein the pair of reflectors is selected from porro prisms, pi prisms and hollow roof mirrors.

26. An optical spectrum analyzer according to claim 22, wherein the pair of reflectors is selected from porro prisms, pi prisms and hollow roof mirrors.

27. An optical spectrum analyzer according to claim 24, wherein the pair of reflectors is selected from porro prisms and pi prisms.

28. An optical spectrum analyzer according to claim 12, wherein the adjusting means is arranged to adjust the filter means to scan a predetermined spectrum of the light beam.

29. An optical spectrum analyzer according to claim 28, further comprising buffer means connected with the detector means and the adjusting means for storing indications of detected energies in association with indications of spectral tuning of the filter element.

30. Optical apparatus comprising an optical element and a polarization-maintaining multi-pass optical means for defining paths by which at least one linearly-polarized light beam is directed to traverse the optical element a predetermined plurality of times, while maintaining its direction of linear state of polarization, the multi-pass optical means comprising a pair of right-angle reflectors positioned one on each side of the optical element, such that a light beam incident upon on of the reflectors will be reflected to traverse the optical element and be reflected by the other reflector, each reflection rotating the light beams propagation direction in a plane of incidence common to the light beam when incident and reflected, the reflectors being positioned and dimensioned so that, for every reflection of the light at a surface causing rotation in one direction, there is a complementary reflection of the light beam at the same surface causing rotation in any opposite direction.

31. Optical apparatus according to claim 30, wherein at least one of the pair of right angle reflectors comprises a planar surface extending substantially perpendicular to the paths taken by the light beam when traversing the optical element, and truncating the pair of reflective surfaces short of an apex between notional extensions of the surfaces, the planar surface serving for either receiving or emitting said at least one light beam.

32. Optical apparatus according to claim 30, wherein the polarization-maintaining multi-pass optical means comprises a pair of reflectors selected from porro prisms, pi prisms and hollow roof mirrors.

33. Optical apparatus according to claim 31, wherein the polarization-maintaining multi-pass optical means comprises a pair of reflectors selected from porro prisms, pi prisms and hollow roof mirrors.

34. Optical apparatus according to claim 30, wherein the optical element is an angle-tuned filter positioned between the reflectors.

35. Optical apparatus according to claim 31, wherein the optical element is an angle-tuned filter positioned between the reflectors.

36. Optical apparatus according to claim 32, wherein the optical element is an angle-tuned filter positioned between the reflectors.